

What is claimed is:

1. An electric power steering device comprising:

a steering assist electric motor including a rotation shaft; and

a speed reduction mechanism for transmitting rotation of the rotation shaft of the electric motor to a steering mechanism while reducing a rotation speed of the rotation shaft, wherein

the electric motor includes a motor housing, a stator fixed to the motor housing, a rotor co-rotatable with the rotation shaft, and rotation angle detecting means for detecting a rotation angle of the rotor,

the rotation angle detecting means includes a stationary portion fixed to the motor housing, and a movable portion co-rotatable with the rotor,

the rotor includes a rotor body, and a rotor magnet attached to the rotor body in a co-rotatable manner, and

a rotor unit including the rotor and the movable portion of the rotation angle detecting means, the rotor unit being provided as a subassembly of the electric motor.

2. An electric power steering device as set forth in claim 1, wherein

the movable portion of the rotation angle detecting means includes a reference portion serving as

a reference for defining magnetized portions of the rotor magnet.

3. An electric power steering device as set forth in claim 2, wherein the reference portion serves as a reference to be employed for magnetizing a magnetizable member as a production intermediate member for the rotor magnet.

4. An electric power steering device as set forth in claim 1, wherein

the movable portion of the rotation angle detecting means has an annular shape, and

the reference portion includes projections provided on an outer periphery of the movable portion.

5. An electric power steering device as set forth in claim 1, wherein

the rotor body includes an outer tubular portion to which the rotor magnet is fixed, a shaft portion provided coaxially with the outer tubular portion and retaining the movable portion of the rotation angle detecting means, and a connection portion which connects the outer tubular portion and the shaft portion.

6. An electric power steering device as set forth in claim 5, wherein

the rotor magnet has a tubular shape, and

the outer tubular portion has a first engagement

portion on an outer peripheral surface thereof for engagement with the rotor magnet fitted around the outer tubular portion.

7. An electric power steering device as set forth in claim 6, wherein

the shaft portion has a first end portion disposed in the outer tubular portion, and a second end portion axially projecting outside the outer tubular portion,

the first end portion of the shaft portion is connected to the outer tubular portion via the connection portion, and

the second end portion of the shaft portion has a second engagement portion for engagement with the movable portion of the rotation angle detecting means.

8. An electric power steering device as set forth in claim 7, wherein

the first end portion of the shaft portion has a coupling portion for coupling the rotation shaft of the electric motor to the shaft portion.

9. An electric power steering device as set forth in claim 1, wherein

the motor housing includes a tubular body having first and second ends and an opening provided at the first end, and an end cover attached to the first end of the body thereof to close the opening at the first end, and

the stationary portion of the rotation angle detecting means is fixed to the end cover.

10. An electric power steering device as set forth in claim 9, wherein

an attachment member is provided for attaching the end cover to the first end of the motor housing body in a manner such that a position of the end cover is adjustable circumferentially of the motor housing body.

11. An electric power steering device as set forth in claim 10, wherein

the attachment member includes a screw which is screwed into a screw hole formed in the motor housing body through a screw insertion hole formed in the end cover,

the end cover is guided to be displaced circumferentially of the motor housing body by cooperation of the screw insertion hole and the screw slightly screwed into the screw hole.

12. An electric power steering device as set forth in claim 11, wherein

the end cover has a center in alignment with a center of the motor housing body,

the screw insertion hole has an arcuate shape defined about the center of the end cover, and

the stationary portion of the rotation angle detecting means has an annular shape defined about the

center of the end cover.

13. An electric power steering device as set forth in claim 9, wherein

an annular power supply member for power supply to the stator is attached to the first end of the motor housing body, and

the rotation angle detecting means is disposed radially inward of the power supply member.

14. An electric power steering device as set forth in claim 1, wherein

the speed reduction mechanism includes a driving gear and an input shaft co-rotatably provided with the driving gear, and

the input shaft of the speed reduction mechanism and the rotation shaft of the electric motor are provided unitarily as a unitary shaft.

15. An electric power steering device as set forth in claim 14, wherein

the unitary shaft includes a first end portion, a second end portion, and an intermediate portion between the first and second end portions, and

the intermediate portion of the unitary shaft is supported by a combination angular ball bearing.

16. An electric power steering device as set forth in claim 15, wherein

the combination angular ball bearing includes a pair of combined angular ball bearings, and

the pair of combined angular ball bearings are arranged in back-to-back relation.

17. An electric power steering device as set forth in claim 15, wherein

the unitary shaft is supported only by a bearing supporting the first end portion thereof and the combination angular ball bearing supporting the intermediate portion thereof.

18. An electric power steering device as set forth in claim 17, wherein

the bearing supporting the first end portion comprises a deep groove ball bearing.

19. A production method for an electric power steering device including:

a steering assist electric motor including a rotation shaft; and

a speed reduction mechanism for transmitting rotation of the rotation shaft of the electric motor to a steering mechanism while reducing a rotation speed of the rotation shaft, wherein

the electric motor includes a motor housing, a stator fixed to the motor housing, a rotor co-rotatable with the rotation shaft, and rotation angle detecting

means for detecting a rotation angle of the rotor,

the rotation angle detecting means includes a stationary portion fixed to the motor housing, and a movable portion co-rotatable with the rotor,

the rotor includes a rotor body, and a rotor magnet attached to the rotor body in a co-rotatable manner, and

a rotor unit including the rotor and the movable portion of the rotation angle detecting means is provided as a subassembly of the electric motor,

the production method comprising the steps of:  
assembling the rotor unit as the subassembly; and  
incorporating the assembled rotor unit in the motor housing.

20. A production method for an electric power steering device as set forth in claim 19, wherein

the rotor magnet is provided by magnetizing a magnetizable member with reference to the movable portion of the rotation angle detecting means attached to the rotor body in the rotor unit assembling step.